#1

$f(x) = \frac{1}{4}(x+2)^3(x+1)$

degree = 4

pos. Leading ⇒ ↖ ↗

zeros: $-2, -2, -2, -1$

multiplicity: 3, 1

3 → odd crosses

1 → odd crosses

Graph on calc. to check

$f(x) = \frac{1}{10}x^3(x-1)^2$

degree = 5

pos. Leading ⇒ ↓ ↗

zeros: $0, 0, 0, 1, 1$

multiplicity: 3, 2

3 → odd crosses

2 → even bounces

Graph on calc. to check

#2 $f(x) = x^3 + 6x^2 + 11x + 12$

Rational zeros $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

Descartes $f(x) = x^3 + 6x^2 + 11x + 12$ 0 pos.

$f(-x) = (-x)^3 + 6(-x)^2 + 11(-x) + 12$

$= -x^3 + 6x^2 - 11x + 12$ 3 or 1 neg.

-4	1	6	11	12
		4	-8	-12
	1	2	3	0

$x^2 + 2x + 3$

$(x+1)(x+2)$

Zeros: $-1, -2, -4$

factored: $(x+1)(x+2)(x+4)$

Show me a bound

-6	1	6	11	12
		-6	0	-66
	1	0	11	54
	↓ pos	neg	↓ pos	↓ neg.

Lower bound

#3

$f(x) = x^2 - 8x + 15$

$(x-3)(x-5)$

x-int = 3, 5

vertex

$h = -\frac{b}{2a}$

$h = \frac{8}{2} = 4 = x\text{-coord.}$

$f(4) = (4)^2 - 8(4) + 15$

$f(4) = -1 = y\text{-coord}$

vertex (4, -1)

$f(x) = 3x^2 - 2x + 5$

x-int

$\frac{2 \pm \sqrt{4 - 4(3)(5)}}{2(3)}$

$\frac{2 \pm \sqrt{-56}}{6}$

$\sqrt{-56} = \sqrt{4} \cdot \sqrt{14} \cdot \sqrt{-1}$

$2\sqrt{14}i$

$\frac{2 \pm 2\sqrt{14}i}{6} =$

x-int

$\frac{1}{3} \pm \frac{1}{3}\sqrt{14}i$

vertex

$h = -\frac{b}{2a}$

$h = \frac{2}{2 \cdot 3} = \frac{1}{3}$

$f(\frac{1}{3}) = 4\frac{2}{3}$

vertex

$\frac{1}{3}, 4\frac{2}{3}$

#4

$$f(x) = \frac{x^5 - x^4 - 5x^3 + x^2 + 8x + 4}{x^4 - 2x^3 - 8x^2 + 18x - 9} \Rightarrow \frac{(x-2)^2(x+1)^3}{(x-1)^2(x+3)(x-3)}$$

N(x) top

2	1	-1	-5	1	8	4
		2	2	-6	-10	-4
	1	1	-3	-5	-2	0

2	1	1	-3	-5	-2
		2	6	6	2
	1	3	3	1	0

-1	1	3	3	1
		-1	-2	-1
	1	2	1	0

$x^2 + 2x + 1 \rightarrow (x+1)(x+1)$

D(x)

-3	1	-2	-8	18	-9
		-3	15	-21	9
	1	-5	7	-3	0

1	1	-5	7	-3
		1	-4	3
	1	-4	3	0

$x^2 - 4x + 3$
$(x-3)(x-1)$

X-int (zeros of top) = 2, -1

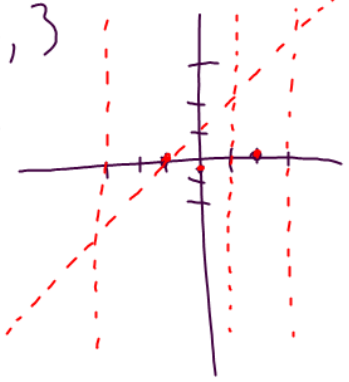
y-int (put 0 in for x) = $-\frac{4}{9}$

vertical asymptotes (zeros of bottom) = 1, -3, 3

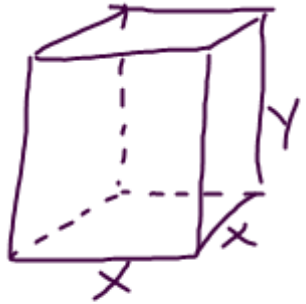
horizontal asymptote (3 rules p. 144) = None

Slant asymptote (divide it) = X+1

Graph on Calc. to check



#5 A = Surface Area



$A = x^2 + x^2 + 4xy$

$V = x^2 \cdot y$

$10 = x^2 \cdot y$

$y = \frac{10}{x^2}$

$A = 2x^2 + 4x\left(\frac{10}{x^2}\right)$

(a) $A = 2x^2 + \frac{40}{x}$

(b) $f(1) = 2(1)^2 + \frac{40}{1}$

$= 42 \text{ ft}^2$

(c) Graph it

$x = 2.15 \text{ ft}$